CURRENT NEWS

மின் செய்திகள்

VOLUME X, ISSUE 8 • AUGUST 2025

POWERING INDIA THROUGH SUSTAINABLE AND CLEAN ENERGY – CHALLENGES AFFECTING ITS ADOPTION

MEENAKSHI CHATURVEDI

At the 26th Conference of the Parties (COP26) to the UNFCCC (United Nations Framework Convention on Climate Change) in Glasgow, Scotland, on November 1, 2021 India announced its climate commitments. India in its battle against global warming and climate change set an ambitious target of generating 50% of its total electricity from non-fossil fuel resources by 2030 and achieving net zero emissions by 2070. The nation has further envisioned investing a great deal in renewables and clean energy technologies, allocating funds and budgets for the same. Generating and providing reliable power at competitive prices in a sustainable manner by optimising the use of multiple energy resources with innovative eco-friendly technologies has been at the core of policy planning in India.

A publication from

CAG

Citizen consumer and civic Action Group

TABLE OF CONTENTS

India is the 3rd largest consumer of electricity in the world and the 3rd largest renewable energy producer. As of 31st July, 2025 the installed renewable capacity stands at 237 GW out of the total installed capacity of 484 GW. It is a tropical country and is blessed to be home to nearly all resources ranging from fossil fuels to renewable resources (with abundant sunshine, wind and rain). India's land mass receives about 5,000 trillion kWh of solar radiation per year, with nearly 300 sunny days in a year. In particular regions of the country (Tamil Nadu, Gujarat, Maharashtra and so), due to the presence of mountains and valleys, ideal wind conditions prevail during certain seasons. The country is endowed with a 7600 km coastline surrounded by water on three sides and has excellent potential for harnessing offshore wind energy. There are many rivers flowing in India. Hydroelectricity is produced from construction of dams over these rivers. Hydro Power plants with a capacity of 25 MW or below are classified as Small Hydro. The estimated potential from small hydel projects is 21133 MW from 7133 sites for power generation in the country. Further, the nation's vast agricultural potential provides agro-residues for biomass energy which is used to meet energy needs, both in heat and power applications. In this way, the geographic location of India makes it an ideal environment for solar, wind, hydel and biomass production.

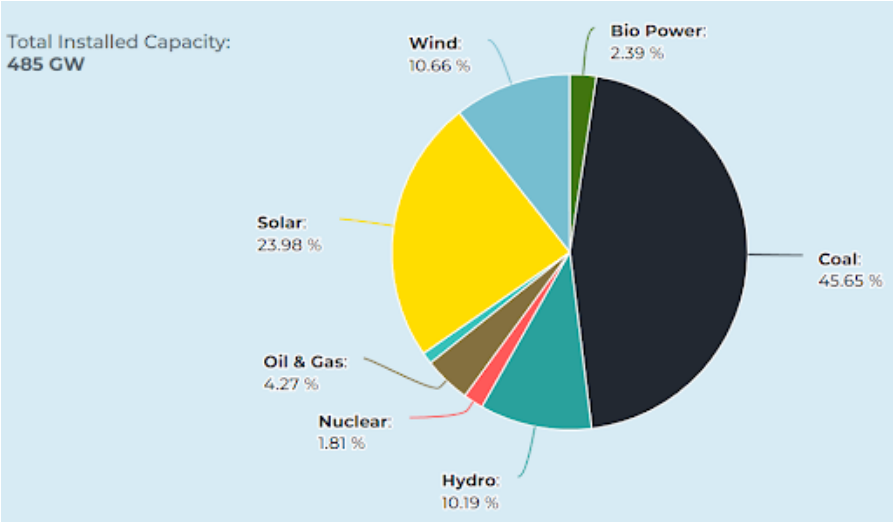


Fig 1 Source-wise electricity installed capacity (as on 30 June 2025) | NITI Aayog

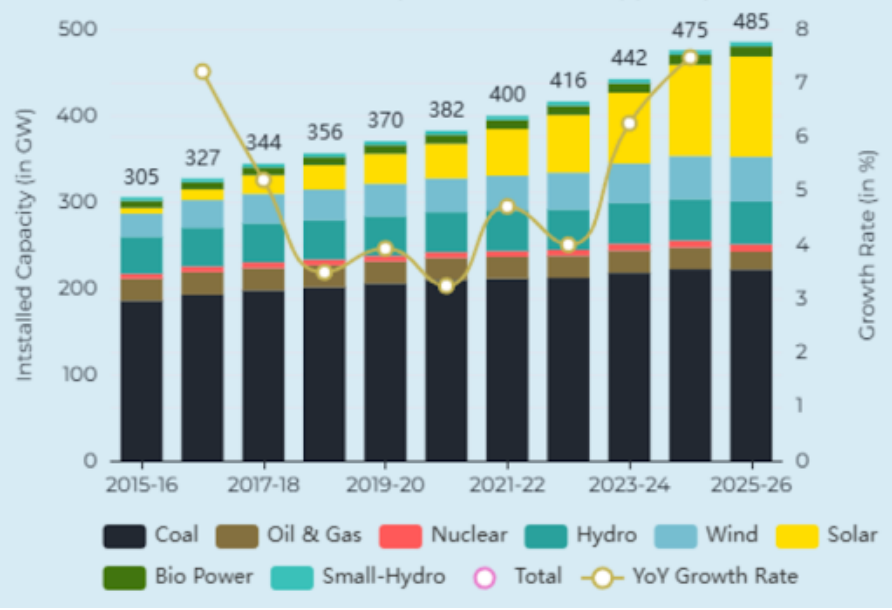


Fig 2 Source-wise electricity installed capacity trends in GW (as on 30 June 2025) | NITI Aayog

The transition towards a sustainable future powered by renewable energy sources can be seen from the above figures. An increasing trend of power generation from renewable energy sources in India can be observed with almost no addition of fossil fuel based power plants to the grid.

With this said, generating power from renewable energy poses challenges which hinder the adoption of renewable energy systems in India.

1. Intermittency of renewable sources

One of the key drawbacks is that renewable sources are intermittent in nature. While fossil fuels are available on-demand, renewable technologies depend on the weather and other factors to run. The production of electricity from these plants is not reliable as they depend on the availability of sunshine, wind, and water flow.

Solar energy is available only from 8 in the morning till 5 in the evening. Cloudy and rainy conditions further affect the generation. Energy from wind power plants is weather dependent and available only during particular seasons of the year. Wind turbines operate when the velocity of wind is above a certain limit (cut-in velocity) and the amount of energy produced varies with the wind speed and consistency. Small hydro projects, especially run-of-river types, are highly dependent on the natural flow of water. During dry seasons and periods of drought, water flow decreases significantly, leading to reduced or no electricity generation. This makes their output less predictable. These are the main reasons as to why base load in an electrical grid is met mostly by coal and nuclear power plants as power from RE plants is not always available.

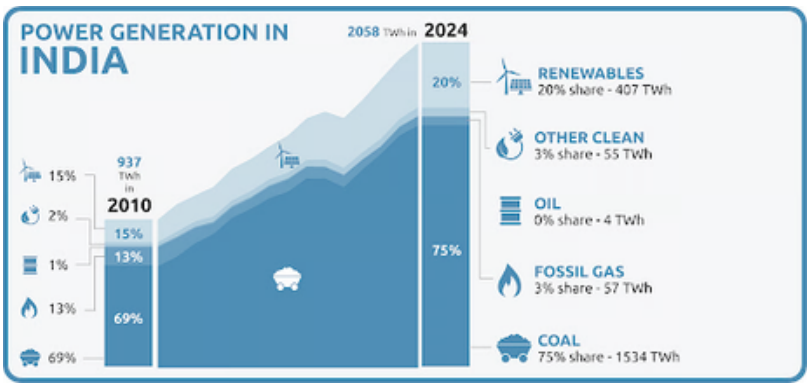


Fig 3 Electricity generation from various sources | Down To Earth

2. Unstable Grid

Injection of power to the electrical grid from a renewable power plant leads to an instability in the grid. Since the availability of renewable resources is intermittent in nature the power injection to the grid is not continuous. In other words the output from the renewable based power plant is uncontrollable which results in the instability of the grid reducing the grid efficiency.

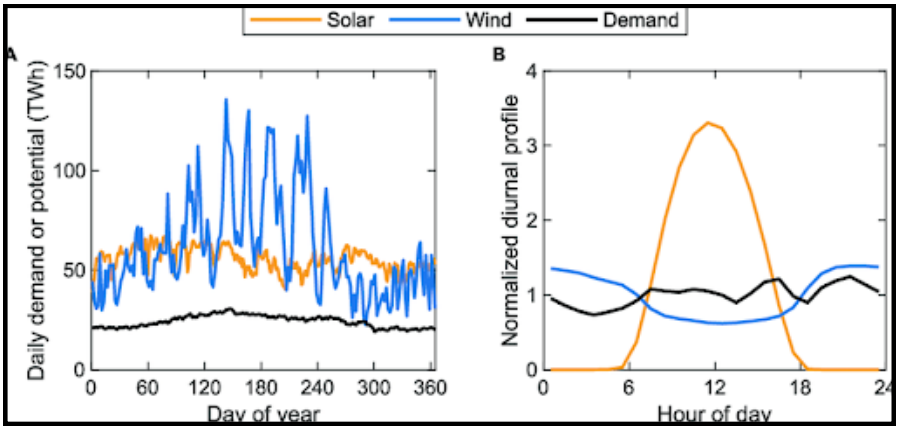


Fig 4 Image illustrating the intermittency of renewable energy, especially solar and wind, contributing to grid instability | iScience

The figure confirms that renewable energy supply is inherently variable and often misaligned with demand patterns. The output from solar and wind vary diurnally and seasonally highlighting their intermittent nature and they don't deliver power steadily. This pushes the grid to constantly compensate often using flexible backup sources like thermal or large hydro. This unpredictability disrupts grid equilibrium, reduces operational efficiency, and poses significant challenges for frequency and voltage control.

3. Inadequate grid Infrastructure

Renewable-rich regions where RE plants are installed are often located far from cities and major electricity demand centers. The current transmission infrastructure is not always equipped to evacuate and distribute large volumes of clean energy efficiently, leading to curtailment and underutilization of these assets. The transmission infrastructure is just not keeping pace with the growing renewable energy.

Renewable-rich zones of solar and wind (e.g., Rajasthan, Gujarat) are geographically distant from demand centers like Delhi-NCR or Mumbai. The Muppandal wind farm situated in the Kanyakumari district of Tamil Nadu is the largest onshore wind farm in the country. This again is situated far away from the energy intensive capital of Chennai. Transmission expansion has not matched the pace of project commissioning. For instance, solar-rich states experience solar fluctuations that create grid instability forming the "duck curve" with excess generation at midday and shortfalls in the evening increasing the reliance on fossil fuel plants. The top green power producing state, Rajasthan is facing prolonged and frequent curtailments, which had risen to 48% of output during peak generation hours.

4. High investment cost

The initial investment in a renewable based power plant is quite high in comparison to fossil fuel based power plants. Solar and wind farms take up much more space to produce the same amount of energy as compared to coal power plants. Fossil fuel and nuclear plants are much more compact compared to renewables. The power density of nuclear, coal, solar and wind power plants are 240, 135, 6.6 and 1.8 respectively. This means solar PV requires over 20 times more land, and wind requires 75 times the land than coal for the same power output.

The cost of procuring land and the complex process of land acquisition, setting up of the infrastructure (solar PV panels, wind turbines) leads to high upfront investment. Further, renewable projects are in remote, resource-rich areas (e.g., deserts for solar, coastal/mountain regions for wind) which require additional investment in transmission lines and substations. These heavy upfront investments pose a barrier in some cases that slow down renewable deployment despite falling per-unit generation costs.

Bhadla power plant located in the Thar desert of Rajasthan (India's largest solar park - 2.23 GW) - Occupying an area of 56 sq. Km | N S Energy

Muppandal Wind farm at Tamil Nadu - India's largest wind farm | Wikipedia

5. Geographic constraints

Installation of a renewable energy power plant depends mainly on the availability of the resource at that particular location. Not all locations are equally suited for all renewable energy sources. For example, an ideal location for a wind plant is near shore or in mountains and valleys with high wind speed. Similarly, solar plants are installed at places with high intensity of solar radiation. The solar power and wind power potential in India is shown where it can be clearly observed that certain locations have high potential whereas certain locations are not suitable for installing the system.

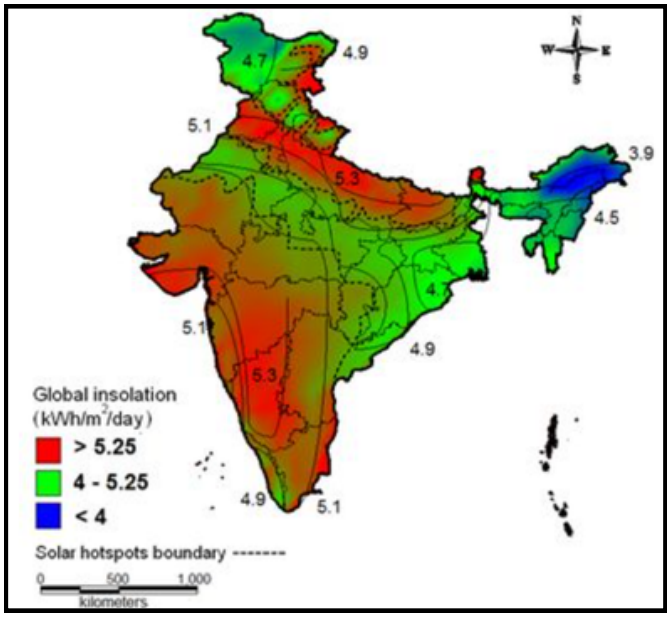


Fig 6 Annual average Global insolation map of India showing the isohels and solar hotspots | ScienceDirect

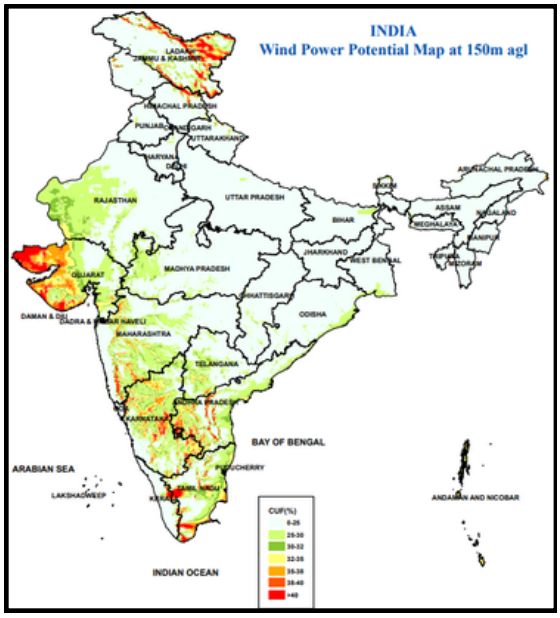


Fig 7 Wind power potential of India | NIWE

6. Policy and regulatory uncertainty

Frequent changes in tariffs, policies and regulations at both central and state levels create uncertainty for investors and project developers. When policies keep shifting, they feel unsure if their project will remain profitable in the long run, deterring long-term commitments. To start a renewable power plant, a developer needs several permits such as land approval, environmental clearance, grid connection approval, etc. These processes are slow and complicated, which delays projects and increases costs. Obtaining necessary permits, clearances, and licenses can be time-consuming and complex, slowing down project execution. Despite national targets, some states show reluctance to sign new Power Purchase Agreements (PPA) for renewable energy.

Many state electricity boards are already in debt. They worry that renewable power, being variable, is less reliable than coal. So, they prefer to avoid long-term commitments with renewable developers slowing down the growth of new solar and wind projects.

Even though generating power from renewable energy is a clean and green process, few RE projects can still impact our environment and leave a carbon footprint as there are GHG emissions from these plants too. Also, the energy output from most of the RE power plants is lower in comparison to the traditional fossil fuels-based plants. In spite of India installing 50% of its installed capacity from non-conventional resources, 75% of electricity is still produced from thermal power plants. These challenges pose a threat to India in achieving its target of generating 500 GW of its electricity from non-fossil fuel resources by 2030.

CONSUMER FOCUS

The appellant is a consumer with a domestic connection who lives in a housing complex with two separate dwelling units belonging to his family. The door numbers for the two units are 4/50 and 4/51/1. The consumer's father resides at Door No. 4/50, which is tile-roof and has two rooms. The consumer himself stayed with his wife and children at 4/51/1 which is a concrete house.

The consumer approached the Assistant Engineer (AE) regarding the two electricity connections which had been merged and requested that he separate them and calculate the electricity charges based on them as individual service connections.

The consumer stated that during the AE's inspection, his parents were residing with him as his mother was recovering from surgery. The consumer believed that this temporary arrangement had misled the inspection team into believing that the entire family was residing in one house. The consumer mentioned to the AE that after his mother's recovery, his parents would return to their own home at Door No. 4/50. However, the AE stated that this cannot be done as there was no physical separation between the two houses.

Dissatisfied with the AE's reply, the consumer filed a petition before the Consumer Grievance Redressal Forum (CGRF) seeking to restore the independent connections.

During the CGRF hearing, the respondent (TNPDCL) explained the history of the two service connections (SC):

- SC No. 399 was sanctioned on 10.02.1994 to a building bearing Door No. 4/35E.
- Later, SC No 1059 was effected for another portion of the same building, subsequently assigned Door No. 4/50.

The respondent confirmed that the old door number 4/35E corresponded to the current door number 4/50, thereby showing that both service connections were tied to the same building. The respondents further stated that while ration cards showed different numbers, namely 4/50 and 4/51/1 , there was no service connection sanctioned for Door No. 4/51/1. The Aadhar cards of both the consumer's father and the consumer also carried the same address pertaining to Door No. 4/50.

A field inspection by the officials revealed that the entire family—the consumer's father, consumer's mother, the consumer, the consumer's wife, and their two children—were all residing in a single building. The so-called annexure was being used merely to store firewood and other objects, not as a separate residential unit. Tax receipts for both Door Nos. 4/50 and 4/51/1 stood in the name of the consumers' father, and no records established ownership of any separate building by the consumer. On this basis, the respondents argued that only one service connection was eligible for the premises.

The respondents highlighted Regulation 27, Tamil Nadu Electricity Distribution Code, 2004 and the Tariff Order No. 06 of 2023 (FY 2023-24), stating that only one service connection is permissible for the premises. Therefore, the merger of SC Nos. 399 and 1059 were both lawful and proper.

Therefore, the Consumer Grievance Redressal Forum (CGRF) issued an order stating that both service connections pertained to a single building with no sufficient physical or electrical segregation. Therefore, the consumer's prayer for separate connections is not permissible as per the regulations.

Dissatisfied with the CGRF order, the consumer filed a complaint with the Electricity Ombudsman.

The Electricity Ombudsman observed that the service connections were registered in the name of the consumer's father. As per Regulation 33, Tamil Nadu Electricity Distribution Code 2004, the agreement holder (consumer) alone, or his duly authorized representative, could approach the forum. Although a petition had been submitted by the consumer, the CGRF should not have entertained the grievance in the name of the consumer, who is not the consumer.

Regulation 2(e), 2(f) & 2(g) of the Regulations for CGRF and Electricity Ombudsman states that

> *"2(e) "complainant" means;- (i) a consumer of electricity supplied by the Licensee including applicants for new connections; (ii) any voluntary consumer association registered under the Companies Act, 1956 (1 of 1956) or under any other law for the time being in force; (iii) the Central Government or any State Government - who or which makes the complaint; (iv) one or more consumers, where there are numerous consumers having the same interest; (v) in case of death of a consumer, his legal heirs or representatives."*
>
> *2(f) "complaint" means any grievance made by a complainant in writing on:- (i) defect or deficiency in electricity service provided by the licensee; (ii) unfair or restrictive trade practices of licensee in providing electricity services; (iii) Charging of a price in excess of the price fixed by the Commission for consumption of electricity and allied services; (iv) Electricity services which will be unsafe or hazardous to public life in contravention of the provisions of any law for the time being in force.*
>
> *2(g) "consumer" means any person who is supplied with electricity for his own use by a licensee or the Government or by any other person engaged in the business of supplying electricity to the public under this Act or any other law for the time being in force and includes any person whose premises are for the time being connected for the purpose of receiving electricity with the works of a licensee, the Government or such other person as the case may be*

On a careful reading of the above-said definitions, it is noted that the grievance related to the electricity service provided to the consumer for his/her own use alone could be redressed by CGRF & Electricity Ombudsman. In the present case, the consumer is neither a consumer nor the consumer's authorised representative.

Therefore, this appeal cannot be entertained and is accordingly dismissed, as the consumer is not the consumer of the service connection under dispute.

SOURCE: OMBUDSMAN CASE

NEWS FROM TAMIL NADU

Power distribution network in Chennai, nearby districts set for an upgrade

The Tamil Nadu Power Distribution Corporation (TNPDCL) is planning a major upgrade to the electricity transmission network by commissioning new substations and improving several existing ones in Chennai and its neighbouring districts to prevent power cuts and voltage fluctuations during the summer months. The TNPDCL, which is the restructured entity of the Tamil Nadu Generation and Distribution Corporation (Tangedco), will set up 12 33/11 kilovolt (kV) substations to ramp up the distribution network in areas with increased power demand. While the Electricity Department has adequate electricity generation capacity, certain parts of the city and Tiruvallur district, faced unscheduled power cuts during the peak summer months this year. Consumer activist T. Sadagopan said the delay in the upgrading and renovation of the 110-kV substation in Avadi, which is one of oldest substations, has resulted in several western suburbs such as Avadi, Pattabhiram, and Paruthipet facing power disruptions. While welcoming the announcement to construct three new 33/11 kV substations, he wanted one to be constructed at the newly inaugurated TIDEL Park. A total of 133 new substations is planned to be built across the State. Meanwhile, J. Radhakrishnan, TNPDCL Chairman and Managing Director, chaired a meeting with senior officials on fast-tracking the turnkey substation projects. In addition to the new substations, the Electricity Department will upgrade the capacity of 33/11 kV substations at 11 places in the city at 39 crore, and at nine places in Kancheepuram district at a cost of 73 crore. The works will begin soon, the official said.

SOURCE: THEHINDU, 01 AUGUST 2025

NEWS FROM ACROSS THE COUNTRY

Solar accounts for 77% of India's $11.8 bn clean energy inflows in H1 2025: Report

India attracted $11.8 billion in renewable energy investments in the first half of 2025, the second highest half-yearly inflow on record, according to BloombergNEF's (BNEF) 2H 2025 Renewable Energy Investment Tracker. The investment, slightly lower than the same period last year, covered debt and equity raised for utility-scale projects and small-scale solar development. During the review, solar energy accounted for 77 per cent of the total new investment, the report said. India had awarded 59 gigawatts of capacity in 2024, largely standalone solar and hybrid projects, which will support capacity additions through 2030. Investment in the wind sector halved compared to the same period in 2024 but was 28 per cent higher than in the second half of 2024. H1 2024 had seen a record $4.2 billion of onshore wind investment, it added. "Despite investors and developers globally pulling back from onshore wind and utility-scale solar projects over fears around revenue uncertainty and return expectations, India continues to hold its strong position in renewable energy investments," said Shantanu Jaiswal, head of BNEF's South and Southeast Asia research. BNEF noted that India's clean power auctions crossed a milestone in 2024, with 59 GW of capacity awarded, more than double that of the previous year. The auctions provided revenue certainty and encouraged larger projects, supporting financing flows. According to the report, India's renewables financing remained largely unaffected by higher borrowing costs in 2023 and 2024, aided by competition among banks, growth of independent power producers (IPPs), government interventions, and sector maturity. "Renewable energy was the third-largest sector for initial public offerings in India between January 2023 and April 2025, raising $3 billion. Firms also secured $2.3 billion from follow-on share sales in this period," said BNEF analyst Rohit Gadre. BNEF forecasts that India's annual wind and solar commissioning will continue to grow, with 611 GW of new capacity expected to be added between 2026 and 2035

SOURCE: ENERGYWORLD.COM, 22 AUGUST 2025

WORLD NEWS

USDA ends programs for solar, wind projects on farms

The U.S. Department of Agriculture will no longer support solar and wind projects on productive farmland, said Agriculture Secretary Brooke Rollins in a post on X on Monday. The move is the latest in a series of actions by the administration of President Donald Trump to stall development of wind and solar energy, which Trump says are unreliable, expensive, and dependent on Chinese supply chains.

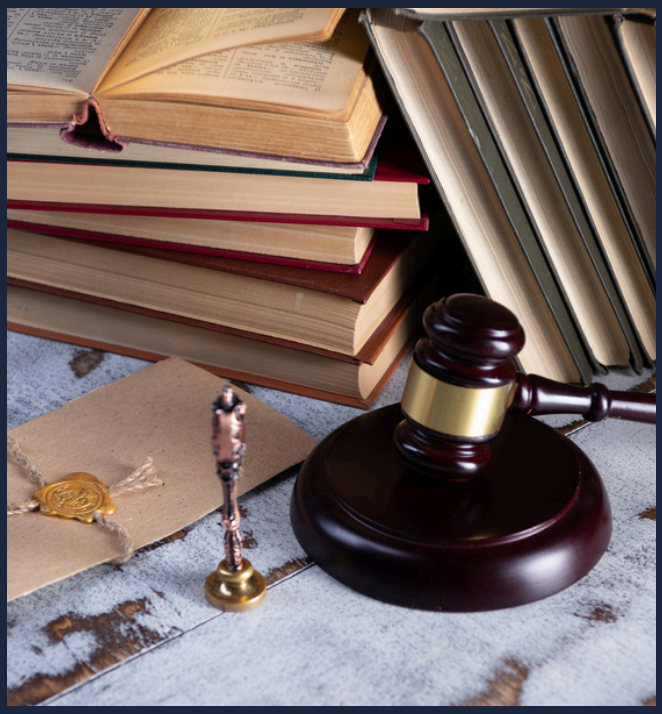
"Millions of acres of prime farmland is left unusable so Green New Deal subsidized solar panels can be built. This destruction of our farms and prime soil is taking away the futures of the next generation of farmers and the future of our country," Rollins said on X. The USDA has provided over $2 billion for renewable energy projects, like solar and wind, through its Rural Energy for America Program, according to the agency website. The agency has also supported clean energy projects for rural electric cooperatives.

The USDA did not immediately respond to a request for comment.

About 424,000 acres (1,715 square kilometers) of rural land were affected by wind turbines and solar farms in 2020, less than 0.05% of the nearly 900 million acres used for farmland, according to a 2024 USDA study. Most of that land stayed in agricultural production after the development of the solar or wind projects, the study found.

The administration of former President Joe Biden supported solar and wind projects in rural areas and on farms as part of its effort to cut climate-harming emissions and make clean energy more affordable.

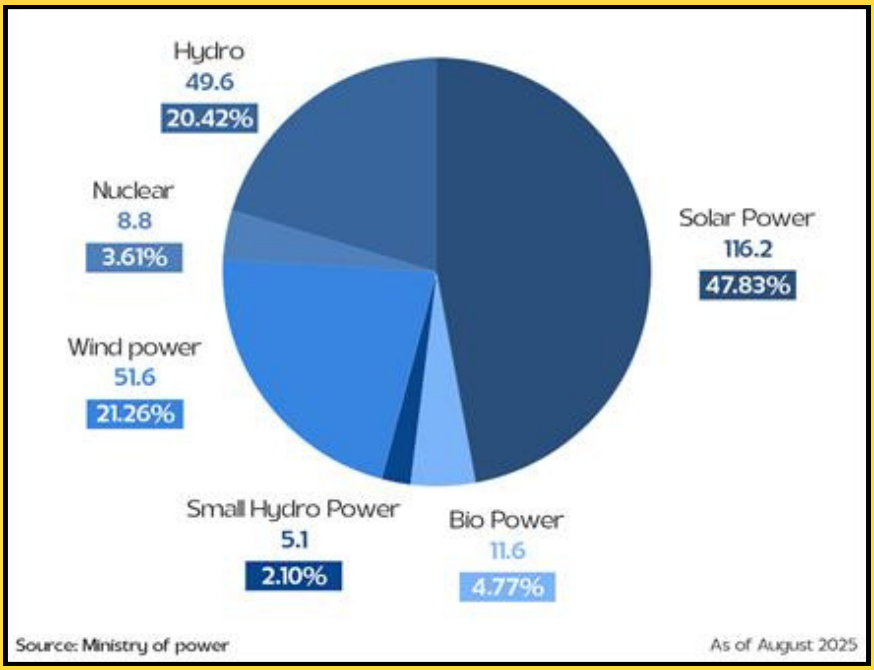
SOURCE: REUTERS, 19 AUGUST 2025



PUBLICATIONS

- **Policy & Regulatory Updates, August 2025, MNRE**
- **India's Renewable Revolution: Building Clean Power, Made in India, PIB**
- **Renewable energy roadmap: Eastern Partnership, IRENA**
- **Frequently Asked Questions (FAQs) on Guidelines for series approval of SPV Modules for conducting testing in Test Labs for implementation of Solar Systems, Devices and Components Goods Order, 2025, MNRE**

NON FOSSIL FUEL INSTALLED CAPACITY IN INDIA (NUMBERS IN GW)



SOURCE: PIB, AUGUST 2025

THANK YOU FOR BEING PART OF OUR WORK!

HAVE ELECTRICITY RELATED QUESTIONS? DON'T FORGET TO CHECK OUT OUR

CHATBOT ON WWW.CAG.ORG.IN

WE ARE ON

@CAGChennai

GET IN TOUCH

+91(44) 2435 4458 | 2435 0387

helpdesk@cag.org.in

No.103 (First Floor), Eldams Road, Teynampet, Chennai-18